Camera remote control with framing controls and display

FIELD OF THE INVENTION

The present invention relates generally to photography.

BACKGROUND OF THE INVENTION

A common inconvenience in consumer photography is that the photographer cannot easily be included in the scene being photographed. Some cameras provide a "self-timer" that allows the photographer to compose a photograph, activate the timer, and place herself in the scene in time to be included in a photograph taken by the camera upon expiration of the timer. However, this solution requires considerable preparation and lacks spontaneity.

Other cameras include a remote control device that can activate the camera from a distance. The photographer can position the camera, place herself in the scene, and use the remote control to take photographs whenever she desires. However, this method gives the photographer no feedback about or control over the composition of the photograph, and does not adapt well to changing scenes.

The inconvenience is particularly acute in video photography. The videographer must typically choose between letting the camera run unattended during an activity, resulting in an unartful recording, or must remove himself from the activity for the duration of the recording to tend to the camera.

Other photographic situations may be envisioned wherein the photographer or videographer wishes to compose and take photographs or video recordings of a scene without the need to tend to the camera continually, whether or not the photographer or videographer wishes to be included in the resulting photograph or recording. What is

needed is a system and method for conveniently and artfully photographing or video recording a scene, which scene may include the photographer, while the camera operator is separated from the camera.

SUMMARY OF THE INVENTION

A photography system includes a digital camera and a remote control that wirelessly communicates with the camera. The remote control includes controls for causing the camera to select a region from its field of view to photograph. The selected region may include the entire field of view of the camera or a portion thereof. The remote control also includes a display screen that shows the photographer the selected region, thus providing feedback that the photographer can use to adjust the selection. The camera may optionally be a still camera, a video camera, or may be capable of taking both still photographs and video recordings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 depicts a system in accordance with an example embodiment of the invention.

Figure 2 depicts a camera situated so that its field of view encompasses a relatively large area of interest.

Figure 3 shows a close up view of a remote control.

Figure 4 represents an array of pixels.

Figure 5 depicts a particular region being selected from the camera's field of view.

Figure 6 shows how the display of the remote control of Figure 3 may appear when a particular region has been selected from the camera's field of view.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 depicts a system in accordance with an example embodiment of the invention, and placed in an example photographic situation where the system can be used to good advantage.

Camera **100** may be placed on a tripod **101** or otherwise held substantially stationary. Camera **100** is directed at a scene to be photographed. Photographer **102** holds a remote control **103**, which communicates wirelessly with camera **100**.

Camera **100** may have a zoom lens or a lens with a fixed focal length. If camera **100** has a zoom lens, it may be configured to a relatively short focal length so as to give the camera a relatively wide field of view. A relatively short focal length is one that is near the shortest focal length the camera is capable of. For example, in a camera with a focal length range of 6 to 18 mm, a focal length near 6 mm would be relatively short. As shown in Figure 2, camera **100** is situated so that the field of view **201** of the lens encompasses a relatively large area of interest, from which regions may be selected to photograph.

Figure 3 shows a close up view of remote control **103**. Remote control **103** comprises a display **301**, which displays visual information transmitted to remote control **103** by camera **100**. Display **103** may be a liquid crystal display, a plasma display, or another kind of display capable of showing visual information. The information shown on display **301** is a representation of the scene viewed by camera **100** or a portion thereof. Display **301** may be thought of as a remote preview screen. A digital camera such as camera **100** typically provides a display screen integrated into the camera body for communicating information about the operation of the camera, for displaying of photographs taken by the camera, and for showing a

preview of photographs to be taken for assisting the user of the camera in composing photographs. The preview typically consists of sequential digital images taken by the camera and shown in relatively rapid succession. Images shown in sufficiently rapid succession may be considered to be a video sequence. The preview images may be at a lower resolution than the camera is capable of. A camera preview mode as described is well known in the art.

Camera **100** may transmit its preview information to remote control **103**, which shows the information on display **301**. The transmission may be accomplished with a wireless communication interface such as one using the Bluetooth standard or the IEEE 802.11 standard. Each of these communication interfaces uses radio communication operating in a frequency band between 2.4 and 2.4835 gigahertz, often referred to as simply 2.4 gigahertz, and has sufficient bandwidth and power to transmit and receive compressed video across distances of several meters. Chipsets for implementing either of these interfaces are readily available. Other interfaces may also be used within the scope of the appended claims.

Remote control **103** also comprises various controls operated by the photographer **102**. The controls allow photographer **102** to perform digital framing of photographs to be taken by camera **100**. Digital framing is the selection and sizing of a region from the field of view of camera **100**.

A digital camera such as camera **100** typically uses a lens to project an image of a scene onto an electronic array light sensor. The electronic array light sensor typically comprises many light-sensitive elements sometimes called "pixels". Each pixel measures the brightness of light emanating from a corresponding location in the scene. The electronic array light sensor typically accumulates electrical charge in each pixel in proportion to the brightness of light falling on the pixel. This charge

quantity is then measured to determine a numerical value. The numerical value is also often called a "pixel". The meaning of the term "pixel" is generally clear from the context of the reference. The set of numerical values resulting from the measurement of the charges from the pixels of the electronic array light sensor may be collected into a numerical array. The numerical array may be called a digital image, a digital photograph, or sometimes simply an image or a photograph. When properly interpreted and displayed, the digital image reproduces the scene photographed by the camera.

In some cases, fewer than all of the pixels on the electronic array light sensor need be measured to determine numerical values. For example, if a photograph of lower resolution than the camera is capable of is desired, or if a photograph of only a portion of the camera's field of view is desired, some accumulations of electrical charge may be discarded without being measured.

Figure 4 represents an array of pixels **401**, and may be thought of as representing the light-sensitive pixels on an electronic array light sensor or as representing corresponding elements in a digital image array. Only a few pixels are shown in Figure 4 for simplicity of explanation. An actual camera may have many thousands or millions of pixels. Many digital cameras use selective wavelength filtering on some pixels to record color information about a scene, allowing such cameras to produce color photographs. One of skill in the art will recognize that the present invention may be embodied in a camera with color capability or one without.

In Figure 4, the entire array **401** corresponds to the entire camera field of view **201**, and in fact the size of the electronic array light sensor and the characteristics of the lens of camera **100** define the camera's field of view **201**. A subarray **402** of pixels may be selected from array **401** in order to select a particular region from the

field of view **201** of camera **100**. In Figure 4, subarray **402** has its origin at row 3, column 5 of array **401**, and subarray **402** is four pixels wide and three pixels high.

The size and location of subarray **402** may be specified and controlled by the photographer **102** using remote control **103**. In an example embodiment, remote control **103** may comprise a four-way rocker switch that allows the photographer **102** to simulated "pan" and "tilt" motions of the camera. For example, the photographer **102** may press the right-pointing arrow of four-way rocker switch **303**. In response, remote control **103** may send a signal to camera **100** indicating that the logic of camera **100** should "move" subarray **402** (or, more accurately, select a different subarray) so that it corresponds to a farther-right region of the camera's field of view **201**. Camera **100** may select the new subarray, and use only that portion of field of view **102** as the preview image transmitted to remote control **103** and displayed on remote control **103**. In this way, the photographer can select a preferred portion of the scene to photograph -- that portion encompassed by the selected region of field of view **102**. As subarray **402** "moves" across the array **401**, the preview image on screen **301** of remote control **103** appears to pan across the scene, even though the camera remains stationary. This simulation of a panning motion of the camera may be called a "digital pan".

Similarly, the photographer **102** may execute a "digital tilt" by pressing the upward or downward pointing arrows on four-way rocker switch **303**. In reaction, the camera logic may select a different subarray **402**, and transmit the resulting preview image to remote control **103**. The preview image shown on display **301** appears to move as if the camera were being tilted up or down.

A "digital zoom" may also be provided. For example, the photographer may press one side of rocker switch **302**. In response, remote control **103** sends a signal to

camera **100** indicating that a larger or smaller subarray **402** is to be selected. In response, the camera logic may select more or fewer pixels to be used to provide a preview image. For example, if the photographer **102** presses the "T" (for "telephoto") side of switch **302**, the camera may reduce the size of subarray **402** without moving the center of subarray **402** in relation to the entire array **401**. The resulting digital image derived from the subarray may then resized appropriately for showing on display **301**, and transmitted to remote control **103**. The resulting display on remote control **103** makes it appear as if the camera's lens focal length were changed.

This functions of digital pan, digital tilt, and digital zoom, performed individually or in any combination, may be referred to as digital framing. Other kinds of controls may be used to implement these functions. For example, digital panning and tilting may be controlled by separate rocker switches on remote control **103** rather than by a four-way rocker switch. Simple individual buttons may be used for each control direction. One of skill in the art will recognize that many other control layouts may be used within the scope of the appended claims.

In an alternative example embodiment, camera **100** may send to the remote control a preview image that includes the entire field of view **201**, and the remote control itself may perform the digital framing. In this alternative example embodiment, the controls on the remote control **103** cause the remote control **103** to simply display a selected portion of the camera's field of view **201**. When the photographer **102** is satisfied with the composition and indicates, using a control on remote control **103**, that a photograph should be taken, remote control **103** sends a signal to camera **100** indicating both that a photograph should be taken and what portion of field of view **201** should be included.

The display **301** of remote control **103** as depicted in Figure 3 shows how the display may look when the entire field of view **102**, corresponding to the entire array **401**, is selected for photographing. Figure 5 depicts a particular region **501**, possibly corresponding to subarray **402**, being selected from the camera's field of view **201**. Figure 6 shows how the display **301** of remote control **103** may appear when region **501** has been selected by appropriate digital framing.

Once the desired digital framing has been accomplished, the photographer **102** may cause a final photograph to be taken by pressing another control on remote control **103**. For example, button **304** may cause a signal to be transmitted to camera **100**, instructing camera **100** to take a photograph including only the selected region of the camera's field of view. Camera **100** may scale the resulting digital image to a larger or smaller size, for example to make it appear as if it were taken with the camera's full resolution, or to conserve image storage capacity.

The system may be similarly used for video recording. The photographer **102** may select a region to be recorded using digital framing, and then may activate recording by using a control on remote control **103**. For example, button **305** may be cause camera **100** to start recording video, and button **306** may cause it to stop. Further digital framing may occur during video recording, allowing for substantial creativity and control on the part of the photographer **102**.

The foregoing description of the present invention has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed, and other modifications and variations may be possible in light of the above teachings. The embodiment was chosen and described in order to best explain the principles of the invention and its practical

application to thereby enable others skilled in the art to best utilize the invention in various embodiments and various modifications as are suited to the particular use contemplated. It is intended that the appended claims be construed to include other alternative embodiments of the invention except insofar as limited by the prior art.